

---

# Differentiable Probabilistic Models

---

**William Watson**  
nextbillyonair@gmail.com

## Abstract

d

## **Contents**



# **1 Introduction**

## **1.1 Philosophy**

# **2 Preliminary**

## **2.1 Gradients**

## **2.2 Jacobian**

## **2.3 Hessian**

## **2.4 Newton Optimization**

# **3 Distributions**

## **3.1 Distribution**

## **3.2 Arcsine**

## **3.3 Bernoulli**

## **3.4 Beta**

## **3.5 Categorical**

## **3.6 Cauchy**

## **3.7 Chi Square**

## **3.8 Conditional Model**

## **3.9 Convolution**

## **3.10 Data**

## **3.11 Dirac Delta**

## **3.12 Dirichlet**

## **3.13 Exponential**

## **3.14 Fisher-Snedcor (F-Distribution)**

## **3.15 Gamma**

## **3.16 Generator**

## **3.17 Gumbel Softmax**

## **3.18 Gumbel**

## **3.19 Half Cauchy**

## **3.20 Half Normal**

## **3.21 Hyperbolic Secant**

## **3.22 Langevin**

## **3.23 Laplace**

## **3.24 Log Cauchy**

## **3.25 Log Laplace**

## **3.26 Log Normal**

## **3.27 Logistic**

## **3.28 Normal (Multivariate)**